heat exchanger. The heat of vaporization supplements heating of the heat exchanger by convection of hot gas within the still cavity. For example, in the fin heat exchanger embodiment, heating of the fins by convection continues even after the fins reach the dew point of the exhaust.

[0689] In accordance with other embodiments of the system, power unit **528010** and still **528012** may be further integrated by streaming water from the still through the power unit for cooling purposes. The use of source water for cooling presents problems due to the untreated nature of the water. Whereas using the product water requires an added complexity of the system to allow for cooling of the power unit before the still has warmed up to full operating conditions.

[0690] Referring again to FIG. **44**, other embodiments may include the use of additives in solid form, wherein such additives could be embedded in a time-release matrix inserted into the flow-through channel of intake **4404**. In one particular embodiment, replacement additive would need to be inserted periodically by the user. In yet another embodiment, a powder form of an additive could be added in a batch system wherein the powder is added, for example in tablet form, to an external reservoir containing water to be purified wherein the additive is uniformly mixed, similar to the batch system for adding liquid additives described above.

[0691] Still referring to FIG. **44**, pre-treatment of the source water may occur prior to or within intake **4404**. Pre-treatment operations may include, but is not limited to gross-filtering; treatment with chemical additives such as polyphosphates, polyacetates, organic acids, or polyaspartates; and electrochemical treatment such as an oscillating magnetic field or an electrical current; degassing; and UV treatment. Additives may be added in liquid form to the incoming liquid stream using a continuous pumping mechanism such as a roller pump or pulsatile pump, including a standard diaphragm pump or piezoelectric diaphragm pump. Alternatively, the additives may be added by a semi-continuous mechanism using, for example, a syringe pump, which would require a re-load cycle, or a batch pumping system, wherein a small volume of the additive would be pumped into a holding volume or reservoir external to the system that uniformly mixes the additive with the liquid before the liquid flows into the system. It is also envisioned that the user could simply drop a prescribed volume of the additive into, for example, a bucket containing the liquid to be purified. Liquid additive may be loaded as either a lifetime quantity (i.e., no consumables for the life of the machine), or as a disposable amount requiring re-loading after consumption.

[0692] Still referring to FIG. **44**, similarly post-treatment of the product water may occur preferably within an external output region (not shown). Post-treatment operations may include, but is not limit to taste additives such as sugar-based additives for sweetening, acids for tartness, and minerals. Other additives, including nutrients, vitamins, stabilized proteins such as creatinine, and fats, and sugars may also be added. Such additives may be added either in liquid or solid form, whether as a time-release tablet through which the output liquid flows or a powder added to an external reservoir such as through a batch system. Alternatively, the additive may be added to the output liquid via an internal coating of a separate collection reservoir or container, for example, by leaching or dissolution on contact. In such embodiments, the ability to detect purified liquid with and without the additive may be preferred. Detection systems in accordance with various embodiments include pH analysis, conductivity and hardness analysis, or other standard electrical-based assays. Such detection systems allow for replacement of additives, as needed, by triggering a signal mechanism when the additive level/quantity is below a pre-set level, or is undetectable.

[0693] In another embodiment, liquid characteristics, such as for example water hardness, is monitored in the output and may be coupled with an indicator mechanism which signals that it is preferable to add appropriate additives.

[0694] In yet another embodiment, ozone is systemically generated using, for example, electric current or discharge methods, and added to the output product for improved taste. Alternatively, air may be pumped through a HEPA filter bubbling through the product water to improve palatability of the water.

[0695] Similarly, it is envisioned that other embodiments may include means for detecting nucleic acids, antigens and bio-organisms such as bacteria. Examples of such detection means include nanoscale chemistry and biochemistry microarrays known in the field and currently commercially available. Such arrays may also be used to monitor the presence and/or absence of nutrients and other additives in the purified product, as discussed above.

[0696] In another embodiment, UV treatment may be used post-purification, for example in a storage barrel or other container, to aid in maintenance of the purified product.

[0697] While the principles of the invention have been described herein, it is to be understood by those skilled in the art that this description is made only by way of example and not as a limitation as to the scope of the invention. Other embodiments are contemplated within the scope of the present invention in addition to the exemplary embodiments shown and described herein. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention.

What is claimed is:

1. A distillation apparatus comprising:
- a source fluid input;
- an evaporator condenser apparatus;
- a heat exchanger fluidly connected to said source fluid input and a product fluid output; and
- a compressor fluidly connected to said evaporator condenser comprising:
  - an inlet port;
  - an outlet port;
  - a stripper plate positioned between said inlet port and said outlet port;
  - a shaft assembly, wherein the shaft assembly comprising:
    - a shaft; and
    - at least one water fed bearing; and
  - a motor configured to drive the shaft, the motor comprising:
    - an inner magnet;
    - an outer magnet; and
    - a drive motor.

2. The apparatus of claim **1** wherein the evaporator condenser apparatus comprising:
- a substantially cylindrical housing; and
- a plurality of tubes in said housing.